CLAIMS

1. An optical scanning device, comprising:

a plurality of light sources;

a single optical deflector that scans light beams emitted respectively from the plurality of light sources;

a first image forming optical system that is disposed between the optical deflector and the plurality of light sources and allows linear images of the light beams to be formed on a common deflecting surface of the optical deflector; and

a second image forming optical system that is disposed between the optical deflector and a plurality of surfaces to be scanned corresponding to the plurality of light sources and has a plurality of curved surface mirrors that are in one-to-one correspondence with the plurality of surfaces to be scanned,

wherein the plurality of light sources, the optical deflector, and the second image forming optical system are disposed at different positions in a sub-scanning direction so that light beams from the first image forming optical system are incident respectively on the deflecting surface obliquely with respect to a plane that includes a normal line at a center of the deflecting surface of the optical deflector and is parallel to a main scanning direction (hereinafter, referred to as a "main scanning plane"), and so that light beams from the optical deflector are incident respectively on the plurality of curved surface mirrors obliquely with respect to a plane that includes each of normal lines at vertices of the plurality of curved surface mirrors and is parallel to the main scanning direction,

the plurality of curved surface mirrors are disposed on the same side with respect to the main scanning plane, and

curved surfaces of the plurality of curved surface mirrors vary in shape.

2. The optical scanning device according to claim 1,

wherein the plurality of curved surface mirrors have a width in the sub-scanning direction that increases in a direction from one of the plurality of curved surface mirrors close to the optical deflector toward another of the plurality of curved surface mirrors far from the optical deflector.

3. The optical scanning device according to claim 1,

wherein in a plane including a rotation axis of the optical deflector and the vertices of the plurality of curved surface mirrors, no two from among a plurality of light beams that are incident on the optical deflector, a plurality of light beams that are reflected off the optical deflector to be incident on the plurality of curved surface mirrors, and a plurality of light beams that are reflected off the plurality of curved surface mirrors to be directed toward the plurality of surfaces to be scanned are parallel to each other.

4. The optical scanning device according to claim 1,

wherein in a plane including a rotation axis of the optical deflector and the vertices of the plurality of curved surface mirrors, a light beam that is incident on the surface to be scanned farthest from the optical deflector among the plurality of surfaces to be scanned forms an angle of not larger than 20 degrees with respect to a light beam that is incident on the surface to be scanned closest to the optical deflector among the plurality of surfaces to be scanned.

5. The optical scanning device according to claim 1,

wherein the plurality of curved surface mirrors are configured integrally.

6. The optical scanning device according to claim 1,

wherein the plurality of curved surface mirrors vary in position of the vertices in the sub-scanning direction.

7. The optical scanning device according to claim 1,

wherein in the sub-scanning direction, the vertices of the plurality of curved surface mirrors are at a distance from a middle portion in the sub-scanning direction of a corresponding one of the plurality of curved surface mirrors, which increases in a direction from one of the plurality of curved surface mirrors close to the optical deflector toward another of the plurality of curved surface mirrors far from the optical deflector.

8. The optical scanning device according to claim 1,

wherein the first image forming optical system comprises a single

cylindrical lens on which a plurality of the light beams are incident.

9. The optical scanning device according to claim 8,

wherein a single aperture further is provided that has a plurality of openings for adjusting shapes of light beams emitted from the plurality of light sources, and the aperture is disposed immediately in front of the cylindrical lens.

10. The optical scanning device according to claim 1,

wherein no two from among a plurality of light beams emitted from the plurality of light sources are parallel to each other.

11. The optical scanning device according to claim 1,

wherein in a plane including a rotation axis of the optical deflector and the vertices of the plurality of curved surface mirrors, where: among the plurality of curved surface mirrors, the curved surface mirror closest to the main scanning plane is a first curved surface mirror, the curved surface mirror farthest from the main scanning plane is an N-th (N is an integer not smaller than 2) curved surface mirror, and the vertex of the first curved surface mirror is at a distance Lm from the vertex of the N-th curved surface mirror; among the plurality of surfaces to be scanned, the surface to be scanned corresponding to the first curved surface mirror is a first surface to be scanned, the surface to be scanned corresponding to the N-th curved surface mirror is an N-th surface to be scanned, and an intersection of the first surface to be scanned and an optical axis of a light beam that is incident on the first surface to be scanned is at a distance Li from an intersection of the N-th surface to be scanned and an optical axis of a light beam that is incident on the N-th surface to be scanned; the vertex of the N-th curved surface mirror is at a distance D1 from the deflecting surface; and the vertex of the N-th curved surface mirror is at a distance D2 from the intersection of the N-th surface to be scanned and the optical axis of the light beam that is incident on the N-th surface to be scanned,

a relationship $0.25 < (Lm / Li) / (D1 / D2) < 0.45$ is satisfied.

12. The optical scanning device according to claim 1,

wherein in a plane including a rotation axis of the optical deflector and the vertices of the plurality of curved surface mirrors, where: among a

plurality of light beams that are directed toward the plurality of surfaces to be scanned, the light beam closest to the optical deflector is a first light beam, the light beam farthest from the optical deflector is an N-th (N is an integer not smaller than 2) light beam, and an optical axis of the first light beam forms an angle ßr with respect to an optical axis of the N-th light beam; among the plurality of surfaces to be scanned, the surface to be scanned on which the first light beam is incident is a first surface to be scanned, the surface to be scanned on which the N-th light beam is incident is an N-th surface to be scanned, and an intersection of the first surface to be scanned and the optical axis of the first light beam that is incident on the first surface to be scanned is at a distance Li from an intersection of the N-th surface to be scanned and the optical axis of the N-th light beam that is incident on the N-th surface to be scanned; the vertex of an N-th curved surface mirror corresponding to the N-th surface to be scanned is at a distance D1 from the deflecting surface; and the vertex of the N-th curved surface mirror is at a distance D2 from the intersection of the N-th surface to be scanned and the optical axis of the N-th light beam that is incident on the N-th surface to be scanned,

a relationship $1.0 < (D1 + D2) \cdot \tan\beta r / Li < 1.6$ is satisfied.

13. The optical scanning device according to claim 1,

wherein in a plane including a rotation axis of the optical deflector and the vertices of the plurality of curved surface mirrors, where: among the plurality of curved surface mirrors, the curved surface mirror closest to the main scanning plane is a first curved surface mirror, the curved surface mirror farthest from the main scanning plane is an N-th (N is an integer not smaller than 2) curved surface mirror, among the plurality of surfaces to be scanned, the surface to be scanned corresponding to the first curved surface mirror is a first surface to be scanned, the surface to be scanned corresponding to the N-th curved surface mirror is an N-th surface to be scanned, and a line linking the vertex of the first curved surface mirror with the vertex of the N-th curved surface mirror forms an angle $\Delta\beta$ with respect to a line linking an intersection of the first surface to be scanned and an optical axis of a light beam that is incident on the first surface to be scanned with an intersection of the N-th surface to be scanned and an optical axis of a light beam that is incident on the N-th surface to be scanned; the normal line at the vertex of the N-th curved surface mirror forms an angle ß2 with

respect to an optical axis of an N-th light beam that is incident on the N-th curved surface mirror from the deflecting surface; the vertex of the N-th curved surface mirror is at a distance D1 from the deflecting surface; and the vertex of the N-th curved surface mirror is at a distance D2 from the intersection of the N-th surface to be scanned and the optical axis of the light beam that is incident on the N-th surface to be scanned,

a relationship $-1.8 < \Delta\beta / \beta 2 - 0.2 (D1 / D2) < 0.4$ is satisfied.

14. The optical scanning device according to claim 1,

wherein in a plane including a rotation axis of the optical deflector and the vertices of the plurality of curved surface mirrors (hereinafter, referred to as an "XZ plane"), where: among a plurality of light beams that are directed toward the plurality of surfaces to be scanned, the light beam closest to the optical deflector is a first light beam, the light beam farthest from the optical deflector is an N-th (N is an integer not smaller than 2) light beam, and an optical axis of the first light beam forms an angle βr with respect to an optical axis of the N-th light beam;

a plane that is orthogonal to the XZ plane and includes each of the normal lines at the vertices of the plurality of curved surface mirrors is a YZ plane in each of the plurality of curved surface mirrors;

among the plurality of curved surface mirrors, the curved surface mirror closest to the main scanning plane is a first curved surface mirror, and at the vertex of the first curved surface mirror, the first curved surface mirror has a radius of curvature RxL in a cross section in the XZ plane and a radius of curvature RyL in a cross section in the YZ plane; and

among the plurality of curved surface mirrors, the curved surface mirror farthest from the main scanning plane is an N-th curved surface mirror, and at the vertex of the N-th curved surface mirror, the N-th curved surface mirror has a radius of curvature RxH in a cross section in the XZ plane and a radius of curvature RyH in a cross section in the YZ plane,

a relationship $0.001 < [1 - RyH \cdot RxL / RxH \cdot RyL] / \tan\beta r < 0.012$ is satisfied.

15. The optical scanning device according to claim 1,

wherein in a plane including a rotation axis of the optical deflector and the vertices of the plurality of curved surface mirrors, where among the plurality of curved surface mirrors, the curved surface mirror closest to the

main scanning plane is a first curved surface mirror, the curved surface mirror farthest from the main scanning plane is an N-th (N is an integer not smaller than 2) curved surface mirror, and a line linking an intersection of a first surface to be scanned corresponding to the first curved surface mirror and an optical axis of a light beam that is incident on the first surface to be scanned with an intersection of an N-th surface to be scanned corresponding to the N-th curved surface mirror and an optical axis of a light beam that is incident on the N-th surface to be scanned forms an angle ßid (degree) with respect to an optical axis of an N-th light beam that is incident on the N-th surface to be scanned,

a relationship $55 < ßid \leq 150$ is satisfied.

16. A color image forming apparatus, comprising:

an optical scanning device as claimed in claim 1;

a plurality of photosensitive members that are disposed respectively on the plurality of surfaces to be scanned;

a plurality of developers that correspond respectively to the plurality of photosensitive members and develop toner images of different colors respectively on the plurality of photosensitive members;

a transferring unit that transfers the toner images on the plurality of photosensitive members onto a transfer material; and

a fixer that fixes the toner images transferred onto the transfer material.